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SELECTED ABSTRACTS FROM THE GERMAN PERIODICAL ARCHIV FUER  
ELEKTROTECHNIK "IN THE FIELD OF ELECTRICITY AND ELECTRONICS"

- Vol. ~~XXX~~  
No 6 '49 I. ELECTRON BEAMS OF HIGH CURRENT DENSITY IN ELECTROSTATIC FIELDS. By H. Huber and W. Kleen

pp. 394-414

The article deals with the production of electron beams of high current density in a high vacuum by means of electrostatic focussing. This problem is basic to the design of transit-time tubes of all types.

The considerations are based on J.R. Pierce's investigations on electron guns with current densities in which space charges determine the path of the beam. The extension of these considerations results in relation for the design of electron guns with axialsymmetrical beams which, with given values of current and voltage, possess the least degree of dispersion.

The study offers in analytical and graphical form the necessary fundamentals <sup>for</sup> ~~for~~ designing electron guns with axialsymmetrical beams. The methods required for measuring the field of such systems in the electrolytical bath are discussed.

The design of an electron guns is described in the form of an example and the measuring results are given.

- II. THE MEASUREMENT OF THE APPARENT CAPACITANCE AND THE LOSS ANGLE OF ELECTROLYTICAL CAPACITORS BY MEANS OF THE THREE-CURRENT MEASURING METHOD

pp. 414-419

According to German Standard DIN V 41232, the capacitance of electrolytic capacitors is defined from their apparent capacitance at  $f = 50$  c.p.s. The simplest method of determining this apparent capacitance is a current-voltage measurement. The loss angle, which is defined as the complementary angle to the phase-shift angle of the capacitor impedance, is measured by means of a bridge circuit. The article states details on a three-current measuring method which permits determination of the apparent capacitance by value and phase.

- No 9 '50 III. THE INFLUENCE OF THE FILAMENT TEMPERATURE ON THE CATHODE CURRENT OF ELECTRON TUBES.  
By Gerhardt Kessler.

pp. 601-615

In electron tubes with hot cathodes the relationship between filament input and emission temperature is determined. Then the influence of temperature changes on the cathode current is established and expressed by an equivalent grid voltage whose effect on the amplifier circuit may be compared directly with the measuring voltage, independent of working point and modulation.

The relationships derived are substantiated through measurements under special consideration of the "island formation" and supplemented with numerical values which permit the practical measurement of amplifiers having a small valued lower cut-off frequency.

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pp. 171-177

IV. THE STATIONARY TEMPERATURE OF MODERATELY LONG, CURRENT-CARRYING WIRES.  
By Johannes Fischer, Karlsruhe.

The stationary heating-up of a moderately long linear conductor (wire, rod, or tape) of uniform cross-section and perimeter, suspended between two metal pieces of comparatively large mass and surface, inserted in a gas, liquid, or vacuum, is examined. The conductor is carrying an electrical current of uniform average time value. The present knowledge is limited to an analytical description for the case of lower temperatures and confined to a differential equation used as early as 1822 by Fourier. An analytical treatment covering higher temperatures is still lacking. It is shown in the work that the solution of the task is met with difficulties which are mainly in the sphere of mathematics rather than physics. A nonlinear differential equation with peculiar marginal values is encountered in examining the joint effect of the three factors which determine the heating-up process. The integration of that equation is in no case a single one, particularly if one deals with current-carrying conductors suspended in air, and glow wires in a vacuum. The article deals largely with the mathematical aspects of the problem.

pp. 177-177v. THE SPRAY DISCHARGE. A CAUSE OF BACKFIRE IN MERCURY VAPOR RECTIFIERS. By  
Th. Wasserrab, Mannheim.

The hypothesis published by K.W. Kingdon and E. J. Lawton, according to which small dust particles of insulating material on the plate surface are so highly charged by the back current that field emission becomes possible and backfirings are started, is further developed. First the stationary process of this phenomenon, corresponding to the "spray discharges" discovered by A. Guntherschulze and H. Fricke, are considered and then model concepts derived therefrom are extended to the periodic processes of rectifier operation. The influence of the temperature dependence of the electrical resistance of the insulating-dust particles are examined with the resulting discovery that there is a heavy dependence of the moment of backfire on the plate temperature.

pp. 177-192vi. EQUIVALENT CIRCUITS OF SIX-TERMINAL NETWORKS AND NETWORKS WITH A GREATER  
NUMBER OF TERMINALS. By Gerhard Schmidt.

There are two types of six-terminal networks, namely, those with three ~~open~~ open terminal pairs and those with two sets of three open terminals.

The first part of the work deals with six-terminal networks having three open terminal pairs. Their equations and matrices are given and, through simple extension of the four-terminal TT equivalent circuit, the TT equivalent circuit of the six-terminal network and, in turn, from it, the dual T equivalent circuit is developed. A consideration of symmetrical six-terminal networks is followed by a discussion of the significance of the elements of the matrices. If one closes off a terminal pair of a six-terminal network with a resistor, a four-terminal network is formed by the remaining open terminals. The matrices and equivalent circuits of such four-terminal networks are examined. The last portion of Part I outlines the development from the TT equivalent circuit of the six-terminal network the TT equivalent circuits of networks having any desired number of terminals with more than three open terminal pairs. The second part deals with six-terminal networks with two sets of three open terminals. Their equations and matrices are stated and their equivalent circuits are developed on the basis of four-terminal networks. The

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significance of the elements of the matrices and their relationship to the circuit elements of equivalent circuits is discussed.

pp. 192-216 VII. INVESTIGATIONS ON CABLE INSULATING OILS OF GERMAN ORIGIN. By Karl Brinkmann, Braunschweig.

The electrical and physico-chemical properties of cable-insulating oils and their influence on high-voltage cables are discussed. A brief description of measuring instruments and research methods is followed by the results of measurements on pure insulating oils as well as on insulating oils with resinous admixtures. The usability of these oils of German origin as cable impregnation is substantiated with a series of measurements on high-voltage cables. The interpretation of the test results furnishes valuable hints for the further development of cable insulating oils with considerably improved essential properties.

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